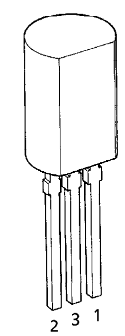
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA78DS05BP, TA78DS06BP, TA78DS08BP, TA78DS09BP TA78DS10BP, TA78DS12BP, TA78DS15BP, TA78DS05CP

5V, 6V, 8V, 9V, 10V, 12V, 15V

LOW DROPOUT VOLTAGE REGULATOR

The TA78DS× ×BP series consists of positive fixed output voltage regulator IC capable of sourcing current up to 30mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery powered equipment. This series includes current limiting, thermal shutdown, over voltage protection, input fault protection and excessive transient protection circuits internally.



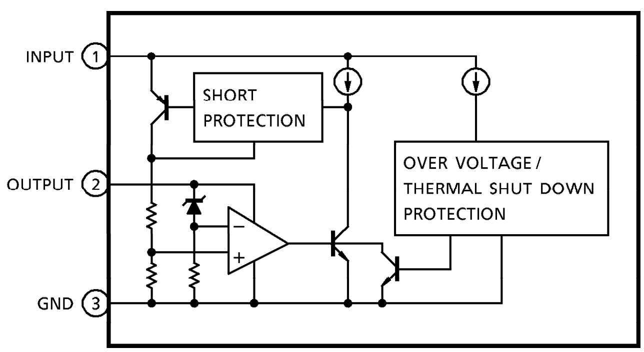
SSIP3-P-1.27

Weight : 0.36g (Typ.)

FEATURES

- Low Standby Current of 600μA Typical.
- Maximum Output Current Up to 30mA.
- Low Dropout Voltage of Less than 0.3V.
- Multi-protection : Reverse Connection of Power Supply, 60V Load Dump, Thermal Shut Down and Current Limiting.
- Available in the Plastic TO-92 MOD Package

BLOCK DIAGRAM



961001EBA2

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Operating Input Voltage		V_{IN}	29	V
Input Voltage of Surge		V_{IN}	60	V
Power Dissipation	(Ta = 25°C)	P_D	800	mW
Operating Temperature		T_{opr}	−40~85	°C
Storage Temperature		T_{stg}	−55~150	°C
Operating Junction Temperature		T_j	−40~150	°C
Thermal Resistance		$R_{th\ (j\text{-}a)}$	156	°C / W
Soldering Temperature·Time		T_{sol}	260 (10s)	°C

TA78DS05BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	5.35V ≦ V_{IN} ≦ 26V	4.75	5.0	5.25	V
			5.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	4.5	5.0	5.5	
Line Regulation	Reg-Line	—	9.0V ≦ V_{IN} ≦ 16V	—	1	10	mV
			6.0V ≦ V_{IN} ≦ 26V	—	4	30	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	50	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.6	1	mA
			6V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.7	1	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS05CP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	5.35V ≦ V_{IN} ≦ 26V	4.8	5.0	5.2	V
			5.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	4.75	5.0	5.25	
Line Regulation	Reg-Line	—	9.0V ≦ V_{IN} ≦ 16V	—	1	10	mV
			6.0V ≦ V_{IN} ≦ 26V	—	4	30	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	50	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.6	1	mA
			6V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.7	1	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS06BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 14V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$6.35V \leqq V_{IN} \leqq 26V$	5.7	6.0	6.3	V
			$6.35V \leqq V_{IN} \leqq 26V$ $-40°C \leqq Ta \leqq 85°C$	5.4	6.0	6.6	
Line Regulation	Reg-Line	—	$10V \leqq V_{IN} \leqq 17V$	—	1	20	mV
			$7.0V \leqq V_{IN} \leqq 26V$	—	4	40	
Load Regulation	Reg-Load	—	$5.0mA \leqq I_{OUT} \leqq 30mA$	—	1	60	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	0.6	1.1	mA
			$7V \leqq V_{IN} \leqq 26V$, $I_{OUT} = 5mA$	—	0.7	1.1	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS08BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 14V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$8.35V \leqq V_{IN} \leqq 26V$	7.6	8.0	8.4	V
			$8.35V \leqq V_{IN} \leqq 26V$ $-40°C \leqq Ta \leqq 85°C$	7.2	8.0	8.8	
Line Regulation	Reg-Line	—	$12V \leqq V_{IN} \leqq 19V$	—	2	30	mV
			$9.0V \leqq V_{IN} \leqq 26V$	—	5	60	
Load Regulation	Reg-Load	—	$5.0mA \leqq I_{OUT} \leqq 30mA$	—	4	80	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	0.7	1.2	mA
			$9V \leqq V_{IN} \leqq 26V$, $I_{OUT} = 5mA$	—	0.8	1.2	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS09BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 14V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$9.35V \leqq V_{IN} \leqq 26V$	8.55	9.0	9.45	V
			$9.35V \leqq V_{IN} \leqq 26V$ $-40°C \leqq Ta \leqq 85°C$	8.1	9.0	9.9	
Line Regulation	Reg-Line	—	$13V \leqq V_{IN} \leqq 20V$	—	2	35	mV
			$10V \leqq V_{IN} \leqq 26V$	—	5	70	
Load Regulation	Reg-Load	—	$5.0mA \leqq I_{OUT} \leqq 30mA$	—	4	90	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	0.7	1.3	mA
			$10V \leqq V_{IN} \leqq 26V$, $I_{OUT} = 5mA$	—	0.8	1.3	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS10BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 14V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$10.35V \leqq V_{IN} \leqq 26V$	9.5	10.0	10.5	V
			$10.35V \leqq V_{IN} \leqq 26V$ $-40°C \leqq Ta \leqq 85°C$	9.0	10.0	11.0	
Line Regulation	Reg-Line	—	$14V \leqq V_{IN} \leqq 21V$	—	3	40	mV
			$11V \leqq V_{IN} \leqq 26V$	—	7	80	
Load Regulation	Reg-Load	—	$5.0mA \leqq I_{OUT} \leqq 30mA$	—	6	100	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	0.7	1.4	mA
			$11V \leqq V_{IN} \leqq 26V$, $I_{OUT} = 5mA$	—	0.8	1.4	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS12BP

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{IN} = 18V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

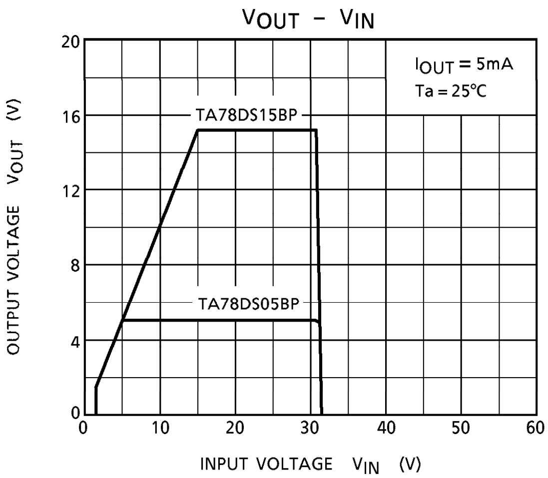
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$12.35V \leq V_{IN} \leq 26V$	11.4	12.0	12.6	V
			$12.35V \leq V_{IN} \leq 26V$, $-40°C \leq Ta \leq 85°C$	10.8	12.0	13.2	
Line Regulation	Reg-Line	—	$16V \leq V_{IN} \leq 23V$	—	4	50	mV
			$13V \leq V_{IN} \leq 26V$	—	8	100	
Load Regulation	Reg-Load	—	$5.0mA \leq I_{OUT} \leq 30mA$	—	2	120	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	0.8	1.5	mA
			$13V \leq V_{IN} \leq 26V$, $I_{OUT} = 5mA$	—	1.0	1.5	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

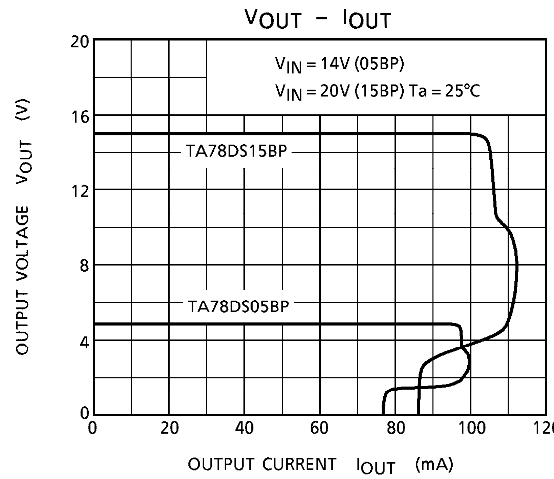
TA78DS15BP

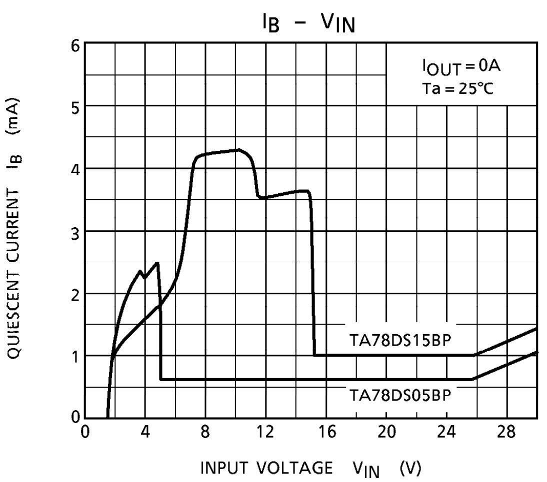
ELECTRICAL CHARACTERISTICS

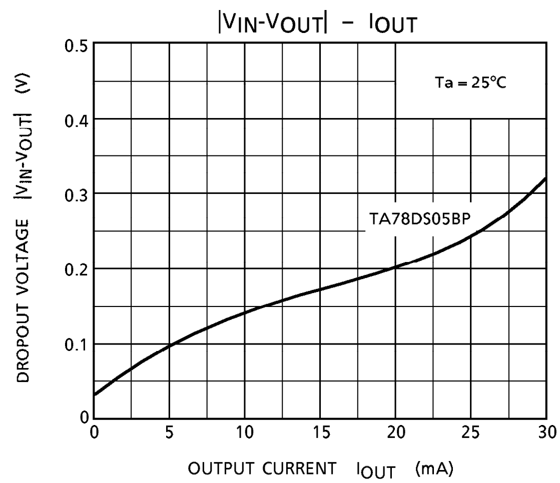
(Unless otherwise specified, $V_{IN} = 20V$, $I_{OUT} = 5mA$, $C_{IN} = 0.1\mu F$, $C_{OUT} = 3.3\mu F$, $T_j = 25°C$)

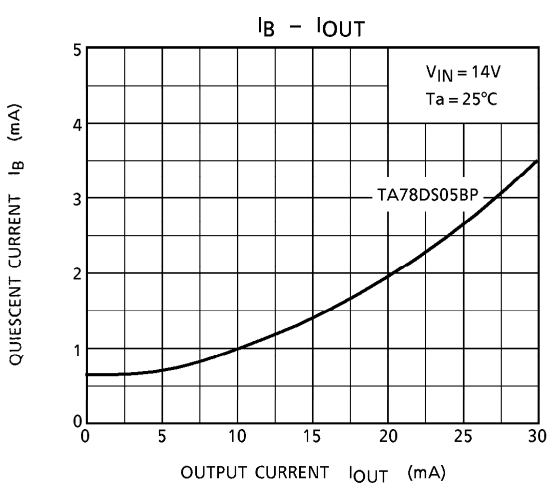
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	$15.35V \leq V_{IN} \leq 26V$	14.25	15.0	15.75	V
			$15.35V \leq V_{IN} \leq 26V$, $-40°C \leq Ta \leq 85°C$	13.5	15.0	16.5	
Line Regulation	Reg-Line	—	$19V \leq V_{IN} \leq 26V$	—	5	60	mV
			$16V \leq V_{IN} \leq 26V$	—	8	130	
Load Regulation	Reg-Load	—	$5.0mA \leq I_{OUT} \leq 30mA$	—	1	150	mV
Quiescent Current	I_B	—	$I_{OUT} = 0$	—	1.0	1.6	mA
			$16V \leq V_{IN} \leq 26V$, $I_{OUT} = 5mA$	—	1.2	1.6	
Dropout Voltage	V_D	—	$I_{OUT} = 5mA$	—	0.1	0.2	V
			$I_{OUT} = 10mA$	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

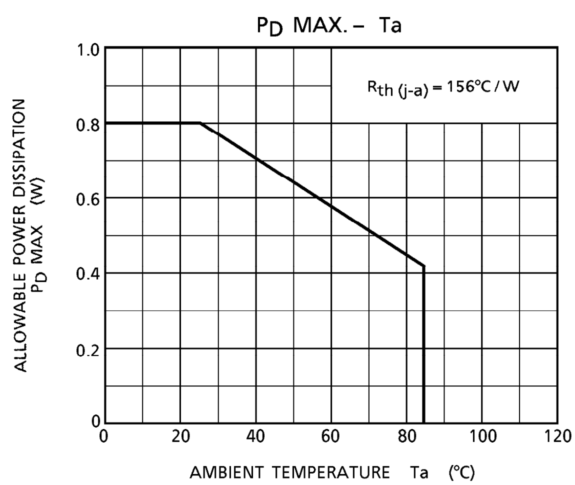

VOUT – VIN
IOUT = 5mA
Ta = 25°C
TA78DS15BP
TA78DS05BP
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)


VOUT – IOUT
VIN = 14V (05BP)
VIN = 20V (15BP) Ta = 25°C
TA78DS15BP
TA78DS05BP
OUTPUT VOLTAGE VOUT (V)
OUTPUT CURRENT IOUT (mA)

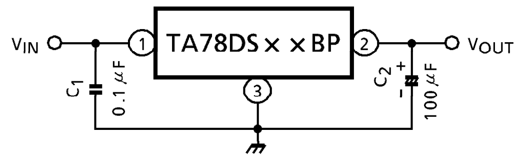

IB – VIN
IOUT = 0A
Ta = 25°C
TA78DS15BP
TA78DS05BP
QUIESCENT CURRENT IB (mA)
INPUT VOLTAGE VIN (V)


|VIN-VOUT| – IOUT
Ta = 25°C
TA78DS05BP
DROPOUT VOLTAGE |VIN-VOUT| (V)
OUTPUT CURRENT IOUT (mA)


IB – IOUT
VIN = 14V
Ta = 25°C
TA78DS05BP
QUIESCENT CURRENT IB (mA)
OUTPUT CURRENT IOUT (mA)


PD MAX. – Ta
Rth (j-a) = 156°C / W
ALLOWABLE POWER DISSIPATION PD MAX (W)
AMBIENT TEMPERATURE Ta (°C)

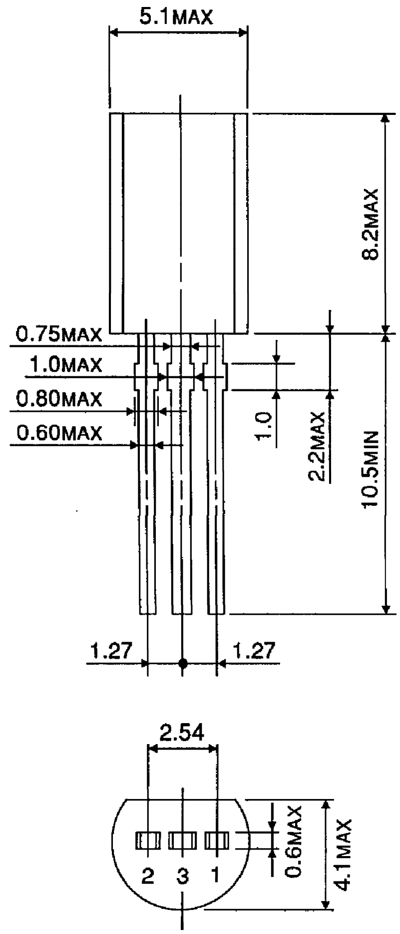
APPLICATION CIRCUIT



Capacitor C_2 must be guaranteed to operate of the temperature range that the regulator should be operated correctly, 100μF is a suitable value to suppress the oscillation phenomenon at the output terminal.

OUTLINE DRAWING
SSIP3-P-1.27

Unit : mm



Weight : 0.36g (Typ.)